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ABSTRACT

This paper uses the data from the 1966 Educational Opportunities Survey (EOS) to investigate regional and racial inequalities in education by applying a definition of inequalities that incorporates both school inputs and educational outcomes. Inequalities in school inputs are weighted by their importance for educational outputs, in order to empirically assess the extent and source of inequalities experienced by different racial and regional groups. A particular racial or regional group is said to experience inequalities relative to another group if its educational achievement is shown to change significantly when its own school inputs are replaced by the school inputs of the other group, while retaining its own family resources. Multiple regression techniques are used to obtain estimates of predicted average achievement for a racial or regional subgroup when they are assigned the average school resources from another group. The difference between the observed mean achievement and the predicted average achievement indicates the degree and direction of the inequality. (Author/JM)

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RACIAL AND REGIONAL INEQUALITIES IN SCHOOL RESOURCES RELATIVE TO THEIR EDUCATIONAL OUTCOMES

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INTRODUCTORY STATEMENT

The Center for Social Organization of Schools has two primary objectives: to develop a scientific knowledge of how schools affect their students, and to use this knowledge to develop better school practices and organization.

The Center works through five programs to achieve its objectives. The Academic Games program has developed simulation games for use in the classroom. It is evaluating the effects of games on student learning and studying how games can improve interpersonal relations in the schools. The Social Accounts program is examining how a student's education affects his actual occupational attainment, and how education results in different vocational outcomes for blacks and whites. The Talents and Competencies program is studying the effects of educational experience on a wide range of human talents, competencies, and personal dispositions in order to formulate -- and research -- important educational goals other than traditional academic achievement. The School Organization program is currently concerned with authority - control structures, task structures, reward systems, and peer group processes in schools. The Careers and Curricula program bases its work upon a theory of career development. It has developed a self-administered vocational guidance device to promote vocational development and to foster satisfying curricular decisions for high school, college, and adult populations.

This report, prepared by the School Organization program, applies a new definition of school inequalities which incorporates measures of school inputs and educational outcomes.

Abstract

A definition of inequalities in school inputs weighted according to their importance for educational outputs is applied to the data from the 1966 Educational Opportunities Survey. The extent and source of inequalities due to race and region are examined. The results are discussed in terms of findings from more restricted definitions of inequalities, and in terms of practical policy considerations.

INTRODUCTION

This paper uses the data from the 1966 Educational Opportunities Survey (EOS) to investigate regional and racial inequalities in education by applying a definition of inequalities that incorporates both school inputs and educational outcomes. The 1966 report (Coleman, et. al.) stated such a definition, but never applied it empirically to the survey data, nor has it been applied in subsequent re-analyses of EOS (Mosteller and Moynihan, 1972). This paper will apply the definition of inequalities in school inputs weighted by their importance for educational outputs, in order to empirically assess the extent and source of inequalities experienced by different racial and regional groups. This definition has advantages over those that consider input measures alone, or output measures apart from inputs.

A definition of regional or racial inequalities solely in terms of inputs would compare the quality of the facilities, curriculum, teaching staff, and student body of the schools attended by the average student from the different regional and racial subgroups. The 1966 report provided numerous tabulations according to this definition of group differences on separate measures of school inputs. But, proceeding in this way, it is difficult to determine clearly which categories of students experience the largest advantages or disadvantages relative to others in the survey. When attributes of a school's facilities, teaching staff and student environment are measured on different scales, the separate measures cannot be combined into a single

summary statistic. With separate indicators, the problem of arriving at a general assessment of which group suffers from the largest inequality becomes particularly troublesome where one group has an apparent advantage on some input measures and a disadvantage on other measures. In fact, the 1966 report frequently showed a mixed pattern of input advantages and disadvantages when comparing regional or racial groups, and as a consequence was unable to draw general conclusions about the degree of inequality between the groups.

But even if all school input resources could be measured on the same scale (such as the dollar cost required to equalize the differences in each input), problems would remain in calculating an overall measure of relative group inequalities which has meaning for student learning. Some input differences which may cost more money to eliminate may not be as important for improving student learning as other input differences which are not so expensive to change. In addition, it is possible that the school inputs which have the strongest effect on learning for one group of students will not be the most important school inputs for another group. Some method is needed to measure school input differences on the same scale and combine them into a summary statistic that assigns weights to these differences according to their importance for learning for each category of students.

Definitions that examined inequalities in terms of outputs alone have also been constructed. These definitions use measures of educational outcomes such as student performance on standardized tests. Schools attended by different regional or racial groups are said to offer unequal opportunities by these definitions if differences exist between the groups in their relative distribution on output measures at a single point in time, or if

their relative positions change over the time spent in schools (Coleman, 1969). While output measures of inequalities may allow a single overall ordering of racial and regional groups, it is questionable whether schools are the only source of these differences. Moreover, since these definitions do not consider different components of schools, they alone do not direct attention to the possible reasons within schools for the observed differences. Approaches are needed which separate the different school components and non-school influences which cause output differences between comparison groups.

METHOD

In this paper, a particular racial or regional group will be said to experience inequalities relative to another group if its educational achievement is shown to change significantly when its own school inputs are replaced by the school inputs of the other group, while retaining its own family resources. For example, an inequality for southern students relative to northerners would be identified if southerners' academic achievement would improve when given the school inputs of northerners in place of their own inputs. Multiple regression techniques will be used to obtain estimates of predicted average achievement for a racial or regional subgroup when they are assigned the average school resources from another group. The difference between the observed mean achievement and the predicted average achievement will indicate the degree and direction of the inequality.

Exercises to arrive at predicted or expected outcomes are a familiar application of multiple regression analysis. First, in a multiple regression analysis on a representative sample, the outcome variable is regressed on

several predictor variables to obtain an equation of the form $z = a + b_1x_1 + \ldots + b_nx_n$. Then expected values of y are determined for different combinations of the predictor variables by substituting appropriate values of x_i in the equation. A similar application of multiple regression analysis will be performed here with the data from the 1966 EOS.

1. Separate multiple regression equations are obtained for subgroups in three grades (6, 9, and 12) in two regions (North and South) and two races (white and black). Using the correlation matrices which were published as a supplement to the EOS report (1966), students' verbal scale scores are regressed on several measures of their family background, school facilities, school teaching staff, and school student body, for each of the twelve grade-regional-race subgroups. The variables for these regression analyses are the same variables which were used in the major regression analyses of the 1966 report. In the ninth and twelfth grade samples, there are 6 family background measures, 11 school facility measures, 7 teacher attributes and 5 student body variables. In the sixth grade the number of variables in each cluster are 6, 4, 7 and 4, respectively.[1]

2. Predicted achievement scores were obtained in each grade for the subgroups White South (WS), White North (WN), Black South (BS) and Black North (BN), by substituting different combinations of school resources into the regression equations. (The school resources were also published in the report supplement.) In each case, an estimate is obtained of the average predicted achievement for a particular group which <u>retains</u> its own family resources but changes school inputs to those held by a different group.

Predicted achievement scores were obtained for the following combinations:

1. WS equation with WS family resources and WN school resources

2. WN equation with WN family resources and WS school resources

3. BS equation with BS family resources and BN school resources

4. BN equation with BN family resources and BS school resources

5. WS equation with WS family resources and BS school resources

6. WN equation with WN family resources and BN school resources

7. BS equation with BS family resources and WS school resources

8. BN equation with BN family resources and WN school resources

The first four combinations above assign school resources from the opposite region within the same racial group. The second four combinations assign school resources from the opposite race within the same regional group.

The school resources are the clusters of variables involving (a) school facilities, (b) school teacher attributes, and (c) school student body characteristics. In obtaining expected achievement scores, the entire set of school resources can be assigned to an equation from a different regional or racial group, or only a subset of the school resources can be replaced while the remainder are retained with actual values held by the group. For example, expected achievement can be obtained by replacing school facilities while retaining actual family background, school teacher attributes, and school student body characteristics.

3. The difference (gain or loss) between the observed average achievement score and the predicted average score is the inequality due to region or due to race. Regional inequalities are the differences between observed average scores and predicted scores when school resources are substituted from the opposite region within the same race. Racial inequalities are the differences between observed and predicted scores when school resources

are substituted from the opposite race within the same region. In each case, these are differences according to a definition of inequality of inputs weighted by their importance for educational outcomes.

It is important to note that in calculating the gains or losses, the family influences on achievement are taken into account in the same way in the observed score and the predicted score. The observed group achievement score is arrived at by calculating the average of achievement scores across all members of the group. However, it could also have been obtained by using the regression equation for the group and substituting into it the values for the actual family resources and school resources of the group. For example, the WS observed mean achievement score is the same value as would be obtained from the WS equation with WS family resources and WS school resources. In this example, the inequality due to region for WS would be the differences between values from WS equation with WS family resources and WS school resources and WS equation with WS family resources and WN school resources. Thus, all the racial and regional differences calculated between observed and expected scores hold constant the family influence on achievement and reflect only the effect of differences in school inputs. We are determining the degree and direction of inequalities in school inputs between racial or regional groups weighted by their importance for achievement, while standardizing for any inequalities in family resources between the groups.

The method used in this paper provides solutions to the shortcomings described above to definitions in terms of school inputs alone or outputs apart from inputs. Solutions are found in the present method to the two objections mentioned above to definitions solely in terms of inputs. The regression coefficients (b_i) in the equation--which express the estimated change in

achievement expected for a unit change in each particular input variable--provide a common basis for combining different measures of school inputs into a single estimate of inequality. The observed achievement and expected achievement values used in calculating gains or losses are obtained by a weighted combination of input differences according to their importance for student learning.

Because the regression equations include separate measures of family background influences on student learning, it is possible to hold constant these factors in comparing expected and observed achievement to assess school inequalities. Moreover, it is possible to reflect which component of school resources (facilities, teachers or student body) contributes most to overall regional or racial inequalities. This is done by utilizing several estimates of predicted achievement which change only one component of school resources while others retain their original values. In this way, the objections described above to inequality definitions in terms of outputs are taken into account.

RESULTS

Table 1 is a summary of the inequalities due to race (i.e., the expected changes in achievement due to reassigning school resources to each group from the other race in its region). Table 2 shows the inequalities due to region (i.e., the expected change from reassigning school inputs from the other region held by the same racial group). In both tables, the differences between observed and predicted average achievement scores are expressed in terms of standard deviation units. The change in achievement from reassigning all school resources is given, as well as the change from reassigning one component of school inputs (families, teachers, or student bodies).

Tables 1 and 2 about here

Inequalities due to race

Each group experiences an important inequality when it receives the school resources of the other race in its region. White southerners would be expected on the average to lose .55 standard deviation units in achievement, white northerners to lose .34, black southerners to gain .29 and black northerners to gain .21. One benchmark for putting these values in perspective is the EOS finding that the average national difference between black and white student achievement is 1.0 standard deviation units. In these terms, this analysis suggests that the present allocation of school resources to whites and blacks within each region accounts for a significant fraction of the achievement gap between the racial groups.

Both racial groups within the South experience greater inequalities than their counterparts in the north. Southern whites are expected to lose more with black resources from their region than northern whites lose, and southern blacks gain more with white resources than northern blacks gain. In other words, the racial inequalities by this definition are greater in the South than in the North.

On the average, whites would lose more than blacks would gain by interchanging the school resources between the two racial groups in each region. However, this average pattern holds only in the sixth and ninth grades, not in grade 12. In the oldest group, blacks stand to gain more achievement than whites would lose by transferring school inputs. This deviation from the average results could be explained either by the pattern of

differences between the school inputs of the two races across the grades, or by differences in learning processes reflected in the regression equations across the grades (possibly due to patterns of dropouts). It is not possible to determine which explanation is more accurate since each separate estimate of gains or losses is based on both an equation and a set of resource values which are different from all other estimates. Thus, it can be differences in either equations or input resources, or both, which create the observed patterns of inequalities across groups.

The particular components of school resources that contribute most to the overall inequalities show an interesting difference between the races. For whites, the disadvantage expected from assuming the school inputs of blacks come mainly from the teacher component--in both the southern and northern white groups, the largest inequality in expected outputs derives from teacher resources. School facility reassignments for whites would not alter expected achievement at all, and attending school with student bodies similar to their black counterparts in the region would not change expected achievement nearly as much as teacher changes.

The inequalities for blacks due to a racial reallocation of school resources come from student body factors as well as from teacher factors. In fact, for northern black students, the student body component of school inputs is clearly a more important source of inequality than teachers. As with whites, school facilities do not contribute to any important expected changes in achievement.

Inequalities due to region

Generally, the inequalities due to region are small and much less than the inequalities due to race. The one exception to this generalization

is for the Black South group. When this group is assigned the average school resources held by black students in the North, the average expected gain in achievement due to regional inequalities is of comparable size to the expected gain for this group due to racial inequalities from reassigning the school inputs of white students in the South.

Focusing on the regional inequalities for the Black South group, the largest average contribution to expected educational outcomes comes from changes in school facilities. Whereas school facilities changes were of no consequence in accounting for inequalities due to race, in this case facilities overshadow teacher inpu s and student body resources, at least in the sixth and ninth grades.

Inequalities due to race and region

Table 3 shows the expected achievement changes deriving from a reassignment of school resources across both race and region. The expected gains or losses are given for each group when they hold the school inputs of the other race in the other region.

Table 3 about here

The changes for each group shown in this table are obtained by calculating differences between the observed achievement and the achievement predicted by substituting values for school resources of the opposite race and region in the regression equation for the group. These gains or losses due to race and region calculated in this way do not equal the sum of the gains or losses due to race shown in Table 1 and the gains or losses from regional inequalities given in Table 2. On the average, the Table 3 values

are larger than the sum of Table 1 and 2 in the North, and smaller in the South. White northerners lose more while black northerners gain more by assuming the school resources of the opposite race and region than might be expected from earlier calculations on the separate inequalities due to race or region; and white southerners lose less while black northerners gain less than might be expected. Remembering that the separate estimates of inequalities due to race and inequalities due to region involved differences of input resources by race within region and by region within race, we can state this result in another way. White northerners lose more by assuming school resources from the opposite race in the opposite region than by the combination of changes in resources by race given region and by region given race, while black northerners gain more, white southerners lose less and black southerners gain less.

The largest inequalities found in Table 3 are for white northerners and black southerners involved in a transference of school resources. White northerners begin with the greatest advantages of both racial and regional allocation of resources, and black southerners start with the most significant disadvantages. The other groups initially have inequalities in different directions due to racial and regional differences in school resources (either a racial advantage and a regional disadvantage, or a regional advantage and a racial disadvantage). By trading school inputs and retaining family resources, white northerners experience an expected loss of .68 units of average achievements, and black southerners reflect an expected gain of .43.

The components of school resources that contribute most to the inequalities differ for whites and blacks. Changes in teacher resources stand out as the largest source of inequality for white students, with neither student

body characteristics nor facilities changes of any consequence in expected achievement losses. In fact, in the case of white southerners, holding the school facilities of the northern blacks shows an expected gain, in the opposite direction of other white changes in school inputs.

While teacher resources stand out as a prominent source of advantage enjoyed by whites, it does not show up in the same relative position among school input components for black students. In most cases, the student body resources contribute somewhat more than other school components to the expected gains for black students. But the differences in inequalities among facility, teacher and student body resource components are not very different in size for the blacks.

DISCUSSION

The method presented in this paper of assessing the inequalities due to the racial or regional allocation of school resources has suggested somewhat different conclusions and emphases than were drawn using more restricted definitions in the original report on EOS.

First, we find here that the regional inequalities within racial groups are of much less significance than the racial inequalities within region. With the important exception of the Black South group, racial differences within regions of school inputs appear to be the much more important source of inequality. In the original report when inputs were considered apart from outputs, summary statements on the relative size of racial and regional inequalities were not offered, although regional inequalities were more frequently cited as being of larger size than racial inequalities (e.g. Coleman, et. al, 1966, p. 12). This difference in conclusions between the present treatment and the original report is due to several things.

The definition used in this paper permitted the combining of input differences weighted by their educational importance so that relative advantages and disadvantages for each group could be assessed in a single summary statistic. In addition, the regional comparisons are not strictly comparable in the two analyses. Regional comparisons in the original report distinguished between metropolitan and nonmetropolitan areas. But correlation matrices and regression equations were not available for the metropolitan and nonmetropolitan localities within each region, so regional comparison with this distinction were not possible under our definition. If metropolitan and nonmetropolitan localities were contrasted, it is possible that regional inequalities within racial groups would have been more prominent under a definition of inputs relative to their educational importance.

Second, in ordering the different components of school inputs according to their importance as a source of inequality, we find that (a) the racial inequalities for whites are accounted for mostly by the advantages they experience from having different teachers than blacks in their region, (b) the racial inequalities for blacks are primarily due to a disadvantageous allocation of student body and teacher inputs, and (c) the regional inequality experienced by southern blacks is mainly the result of the school facilities allocation they experience. The analysis in the original EOS report of how present school resources are related to differences in achievement tended to emphasize the importance of student body resources more than any other school input (Coleman, et al., 1966, p. 325). In this paper, when group differences in school inputs are viewed together with their relationship to achievement, the contribution of teacher and facility resources to inequalities appears important in certain cases.

While the method used in this paper does allow a concise assessment of the existing regional and racial inequalities of school resources which

have most educational meaning, it does not provide a practical guideline for public policy. Without additional information, this approach can be extended only one step further, and this step would place artificial restrictions on policy alternatives. It would be possible by using linear programming techniques with the existing data to determine which reallocation of existing school resources would result in the largest educational gain for the presently disadvantaged groups at the least educational cost to the presently advantaged groups. But this analytic solution would ignore at least two practical considerations which should enter into public policy.

First, it is likely that some resources will be more easily transferred among student groups in terms of financial and political costs. Thus, even if policy were restricted to shifting school resources among student groups while maintaining the existing mix of school resources in the system, we would need to know the practical costs of transference for each kind of input.

Second, policy should not be restricted only to the shifting of existing resources, but should consider the consequences of changing the total mix of investments in school resources within and across categories of facilities, curricula, teachers and enrollment policies. This is especially true since it is likely that the relative monetary costs of changing a particular school input will not always correspond to the educational importance of the change (e.g. Levin, 1970). Thus policy should be free to pursue a program of increasing total investments in certain school inputs for all groups while reducing expenses of other inputs. However, much work needs to be done in determining the relative costs of different school inputs before rigorous practical guidelines are possible for reducing inequalities in school inputs weighted by their educational importance.

FOOTNOTES

1. School facilities measures are:

   Per pupil expenditure on staff

   Volumes per student in library

   Science lab facilities (9 and 12 only)

   Extracurricular activities (9 and 12 only)

   Presence of accelerated curriculum (9 and 12 only)

   Comprehensiveness of curriculum (9 and 12 only)

   Use of tracking (9 and 12 only)

   Movement between tracks (9 and 12 only)

   Size

   Guidance counselors (9 and 12 only)

   School location (city, suburb, town, country)

   Student body characteristics are:

   Proportion whose families own encylopedias

   Number of student transfers

   Attendance

   Proportion planning to attend college (9 and 12 only)

   Teachers' perception of student body quality, 6 only)

   Average hours of homework (9 and 12 only)

   Teacher variables are:

   Average mother's education

   Average years experience in teaching

   Localism

Average level of education of teachers

Average score on vocabulary test

Preference for teaching middle-class, white-collar students

Proportion white teachers

Family background variables are:

Parents' education

Structural integrity of the home

Smallness of family

Items in home

Reading material in home

Urbanism of background

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TABLE 1

Inequalities due to Race

Subgroups equation used	School resources assigned	Change in expected achievement due to reassignment of: Facilities	Teachers	Student body	Total School Resources
White South	BS				
6		-.01	-.59	-.01	-.61
9		.00	-.70	-.08	-.79
12		.01	-.13	-.12	-.25
Average of 3 grades		.00	-.47	-.07	-.55
White North	BN				
6		-.04	-.29	-.10	-.43
9		.00	-.30	-.11	-.40
12		.03	-.13	-.08	-.18
Average of 3 grades		.00	-.24	-.10	-.34
Black South	WS				
6		-.02	.18	.09	.25
9		-.03	.14	.18	.29
12		.00	.16	.17	.33
Average of 3 grades		-.02	.16	.15	.29
Black North	WN				
6		.02	.04	.13	.19
9		.06	.02	.11	.19
12		.00	.10	.15	.25
Average of 3 grades		.03	.05	.13	.21

TABLE 2

Inequalities due to Region

Subgroup equation used	School resources assigned	Change in expected achievement due to reassignment of: Facilities	Teachers	Student Body	Total School Resources
White South	WN				
6		.05	-.01	.00	.04
9		.12	-.01	.02	.12
12		.07	.02	.04	.13
Average of 3 grades		.08	.00	.02	.10
White North	WS				
6		.01	.01	-.02	.00
9		-.03	.01	.00	-.02
12		-.04	.02	-.04	-.06
Average of 3 grades		-.02	.01	-.02	-.03
Black South	BN				
6		.19	.09	.03	.31
9		.20	.08	.09	.37
12		.03	.08	.13	.24
Average of 3 grades		.14	.08	.08	.31
Black North	BS				
6		-.01	-.03	-.01	-.05
9		.11	-.11	-.04	-.04
12		.12	.08	-.15	.05
Average of 3 grades		.07	-.02	-.07	-.01

TABLE 3

Inequalities due to Region and Race

Subgroups equation used	School resources assigned	Change in expected achievement due to reassignment of: Facilities	Teachers	Student Body	Total School Resources
White South	BN				
6		.04	-.26	-.08	-.30
9		.16	-.23	-.02	-.09
12		.10	-.00	.05	.05
Average of 3 grades		.10	-.16	-.05	-.11
White North	BS				
6		.00	-.61	-.04	-.65
9		.00	-.77	-.12	-.90
12		-.01	-.38	-.10	-.50
Average of 3 grades		-.00	-.59	-.09	-.68
Black South	WN				
6		.17	.17	.11	.45
9		.16	.14	.17	.47
12		.02	.13	.22	.37
Average of 3 grades		.12	.15	.17	.43
Black North	WS				
6		.01	.06	.10	.17
9		.12	-.01	.14	.24
12		.08	.17	.09	.34
Average of 3 grades		.07	.07	.11	.25